

Claims

- [c1] 1.A pre-crash sensing system for an automotive vehicle coupled to a countermeasure system having at least a first countermeasure and a second countermeasure comprising:
a radar or lidar unit generating an object distance signal and object relative velocity signal;
a vision system generating an object size signal; and
a controller coupled to said radar unit and said vision unit for activating either said first countermeasure or the first and the second countermeasures in response to said object distance, relative velocity and said object size signals.
- [c2] 2.A system as recited in claim 1 wherein said object size comprises height.
- [c3] 3.A system as recited in claim 1 wherein said object size comprises object area and object height.
- [c4] 4.A system as recited in claim 1 further comprising a vehicle speed sensor generating a speed signal corresponding to the longitudinal speed of the vehicle; wherein said controller activates said countermeasures in response to the longitudinal speed signal.
- [c5] 5.A system as recited in claim 1 further comprising a decision zone; wherein said radar or lidar sensor generates an object distance and relative velocity signals from an object within said decision zone and said vision sensor confirms the presence of the object within the said decision zone.
- [c6] 6.A pre-crash sensing system coupled to a countermeasure system having a first countermeasure and a second countermeasure, said pre-crash sensing system comprising:
a first sensor generating an object distance signal and relative velocity signal for an object present in a predefined decision zone;
a second sensor generating an object size signal; and
a controller coupled to said first sensor and said second sensor for activating either said first countermeasure or said first and said second countermeasures in response to said object distance, said object relative velocity and said object

size signals.

- [c7] 7.A system as recited in claim 6 wherein said object size comprises height.
- [c8] 8.A system as recited in claim 6 wherein said object size comprises object area and height
- 9.A system as recited in claim 6 wherein said controller classifies said object and determines an object orientation in response to said object distance, said object size and said object height.
- [c9] 10.A method for operating a pre-crash sensing system for an automotive vehicle having a countermeasure system, said method comprising:
establishing a decision zone relative to the vehicle;
detecting an object within the decision zone;
determining an object distance and relative velocity;
determining an object size; and
activating the countermeasure system in response to the object size and relative velocity.
- [c10] 11.A method as recited in claim 10 wherein determining object size comprises determining an object height; wherein activating the countermeasure system in response to the object size comprises activating the countermeasure system in response to the object height.
- [c11] 12.A method as recited in claim 10 wherein determining an object size comprises determining an object cross-sectional area; wherein activating the countermeasure system in response to the object size comprises activating the countermeasure system in response to the object cross-sectional area.
- [c12] 13.A method as recited in claim 10 wherein determining an object size comprises determining an object cross-sectional area and object height; wherein activating the countermeasure system in response to the object size comprises activating the countermeasure system in response to the object cross-sectional and object height.
- [c13] 14.A method in claim 13 wherein determining an object cross-sectional area

comprises determining the object cross-sectional area with a vision system.

[c14] 15.A method as recited in claim 10 wherein detecting an object within the decision zone comprises detecting the object within the decision zone with a radar or lidar sensor system and confirming the presence with a vision system.

[c15] 16.A method as recited in claim 10 wherein prior to the step of activating, choosing either the first countermeasure or the first and the second countermeasure in response to said object size.

[c16] 17.A method as recited in claim 10 wherein determining an object comprises determining the vehicle orientation; wherein activating the countermeasure system in response to the object size, comprises activating the countermeasure system in response to the object size and vehicle orientation.

[c17] 18.A method as recited in claim 10 further comprising establishing a decision zone in front of the vehicle.

[c18] 19.A method as recited in claim 18 further comprising detecting an object within the decision zone; and activating the countermeasure in response to detecting an object within the decision zone.

[c19] 20.A method as recited in claim 19 wherein activating the countermeasure system comprises activating a first countermeasure comprising pre-arming airbags and pretensioning motorized belt pretensioners, or activating the above said first countermeasure and a second countermeasure comprising adjusting the host vehicle suspension height in response to object size and orientation.